



## Effect of Multimodal Exercise Program on Functional Outcome, Fatigue and Emotional Health in Mastectomy Patient with Concomitant Rheumatoid Arthritis: A Case Study

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### ABSTRACT

Breast cancer is among the most prevalent type of cancer among women. Mastectomy is a common surgical option for breast cancer, which usually leads to significant functional impairment. Fatigue, anxiety and depression are reported by mastectomy patients. This study aims to investigate the effect of a multimodal exercise program on improving functional impairment, fatigue, anxiety and depression after mastectomy. A 40-year-old female presented with abnormal tissue growth, pain and nipple discharge at the right breast. She was diagnosed with invasive ductal carcinoma stage I and undertook six weeks of neoadjuvant chemotherapy followed by modified radical mastectomy (MRM). Postoperatively, patient had a functional impairment, fatigue, anxiety and depression. An eight-week multimodal exercise program comprising ROM exercises, strength and endurance training, breathing exercises and functional activities was given. DASH for assessing upper extremity functions, BFI for assessing the impact of fatigue on daily activities and HADS for assessing anxiety and depression. An eight-week multimodal exercise program effectively improves functional impairment, fatigue, anxiety and depression in mastectomy patients with rheumatoid arthritis.



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### INTRODUCTION

Breast cancer is the largest contributor to cancer worldwide. A WHO report states that by the year 2020, it was the world's most prevalent case. The

National Cancer Registry Program, India, mentions that breast cancer is on the rise and poses a great health challenge to women [1]. Surgical management of breast cancer includes mastectomy with axillary lymph node dissection (ALND), which is associated with upper limb functional decline [2]. Post-operative musculoskeletal complications such as pain, reduced joint mobility and muscle strength cause functional impairment. Fatigue is a common occurrence which may interfere with physical functioning and quality of life [3]. Mastectomy poses unique challenges to women causing anxiety and depression, which negatively impact physical function, compliance with treatment and emotional well-being [4].

Rheumatoid arthritis is an inflammatory disease that requires treatment with immunosuppressants

to control symptoms and avoid joint destruction. Managing cancer in post-menopausal patients with concomitant rheumatoid arthritis as comorbidity poses clinical challenges causing functional decline [5].

**Table 1: PROM right and left upper extremity**

Shoulder	Right	Left
Flexion	50°	160°
Extension	20°	45°
Abduction	60°	90°
Adduction	60°	90°
Internal rotation	30°	45°
External rotation	40°	60°
Elbow		
Flexion	80°	120°
Extension	80°	120°
Wrist		
Flexion	30°	40°
Extension	30°	45°

**Table 2: MMT values of right and left upper extremity**

Shoulder MMT	Right	Left
Flexors	3+	4+
Extensors	2+	4+
Abductors	2+	4
Adductors	3	4+
Internal rotators	3	4
External rotators	3	4+
Elbow MMT		
Flexors	3+	4+
Extensors	3	4
Supinator	3	4+
Pronators	3	4+
Wrist MMT		
Flexors	3	4+
Extensors	3	4+
Grip strength	4 kg	7 kg

Arthritis is the most common chronic condition present during a breast cancer diagnosis. The presence of comorbid conditions affects the QoL and emotional health of breast cancer survivors [6]. Therapeutic exercise has been a principal component of a multimodal program for mastectomy patients [7]. American College of Sports Medicine experts in exercise for cancer has suggested the necessity to individualize exercise programs to cancer populations [8].

**Table 3: Limb girth measurement values of right and left upper extremity**

Site of Measurement	Right	Left
DIP of Middle Finger	3cm	3cm
MCP Joint	3.5cm	3.5cm
Distal Radioulnar Joint	9.5cm	9.3cm
10 cm proximal to radioulnar joint	10.6cm	10.2cm
Anti-cubital fossa	11.3cm	11cm
10cm proximal to antecubital fossa	15.4cm	15cm
Axillary region	18cm	17cm

**Table 4: Measurement of chest expansion**

Level	Measurement	Difference
Axillary level	105-106cm	1cm
Nipple level	103-104cm	1cm
Xiphisternum	100-101cm	1cm

This case report investigates the effect of an individualised, multimodal exercise program on improving functional impairment, fatigue and emotional health in a patient with rheumatoid arthritis who had undergone mastectomy.

#### PATIENT DETAILS

A 40-year-old female homemaker with right hand dominance, married with four children, resident of a nearby district, presented with abnormal tissue growth in the right breast outer quadrant with pain and nipple discharge. The patient noticed this abnormal and progressively increasing tissue growth two years ago. She visited a local hospital and was referred to our multi-speciality hospital for further investigations and treatment. She was diagnosed with invasive ductal carcinoma of right breast stage I and advised six sessions of neoadjuvant chemotherapy followed by MRM. She took three cycles of neoadjuvant chemotherapy (injection Adriamycin and injection cyclophosphamide) and discontinued citing financial reasons. The remaining cycles of chemotherapy were completed within the next nine months. She was admitted to our hospital for surgery on 28-02-2022 for MRM with resection of the axillary lymph node.

On the day of admission, the patient was afebrile. RAT was negative. The patient was a non-smoker and had no family history of carcinoma. She was menopausal. LCB was 21 years ago. LMB could not be ascertained.



**Figure 1: Incision**



**Figure 2: Deformities Due to RA**



**Figure 3: Grip Strength Measurement Using Hand Held Dynamometer**

On examination, a soft, non-tender, non-adherent, non-distended lump was found in the right breast with retraction of the right nipple. No nipple discharge and noticeable skin changes were present.

She had concomitant comorbidity of rheumatoid arthritis, which she had been suffering for the last fifteen years.

Medication had been prescribed, but she discontinued the medication and developed joint pain in the shoulder, wrist, PIP and DIP joints of the hand, spine and knee joints, along with joint deformities at the wrist and hand Figure 1.

CBC, USG, LFT, 2D Echocardiography, and Colour Doppler were performed on 28-02-2022. USG and cytology reports revealed an ill-defined granular lump measuring approximately 2 X 2.2cm in the upper quadrant with calcification.

The left breast was normal. 2D Echo and Colour Doppler report suggested mild concentric LVH with good LV systolic function.

The case was diagnosed as invasive ductal carcinoma of right breast stage I and MRM were recommended.



**Table 5: 8-Week Exercise Program**

Week	Components of exercise program	Materials used	Dosage and progression
1-2	Deep breathing exercises to help relieve pain and improve chest expansion. Diaphragmatic breathing and lateral costal expansion		10 rep. X 2 times a day in week 1 progressed to 20 rep. X 4 times a day by week 2.
	Shoulder rolls- gently moving shoulder up and down, back and forth.	A chair without arms	10 rep. for each movement X 2 times a day on week 1, progressed to 15-20 rep. X 2 times a day on week 2.
	Elbow winging sitting on a chair. Side bends while sitting on a chair.	A chair without arms	10 rep. for each movement X 2 times a day on week 1, progressed to 15-20 rep. X 2 times a day on week 2.
	Shoulder blade stretch and squeeze sitting on a chair.	A chair without arms Metal / wooden wand	10-20 rep. X 2 times a day.
	Wand exercises- patient in supine, holding the wand across the belly with both hands with palms facing up. Lift the wand overhead as far as possible. Hold for 5-10 sec. and gently lower the wand.		Begin with 10 rep. X 2 times a day Progress to 20 rep. X 2 times a day.
	Chest wall stretch by pushing against a wall.	A vertical wall.	10 rep. 2 times a day. Progress to 20 rep. 2 times a day.
	Walking on a level surface for 10-15 min. 2 times a day. Progressed to 30 min. 2 times a day.	A level surface, e.g., a long corridor	Week 1: patient gets acquainted with exercise protocol. Assessment of maximal workload is done using 6MWT. Plan of progression: Week 1: 60% of maximal workload. Week 2: 65% of maximal workload.
	All functional activities using right U/E.		At least 10-20 min. daily.
3-6	Deep breathing and segmental expansion.  Shoulder rolls		20 rep. 4-5 times a day.

*Continued on next page*



Table 5 continued

Week	Components of exercise program	Materials used	Dosage and progression
	Shoulder blade stretch and squeeze Elbow winging Wand exercises Chest wall stretch by pushing against a wall Arm reach and stick exercises Wall climbing exercises Ball squeezing exercises	Wooden stick A vertical wall A soft ball	20-30 rep. 2 times a day.
	Walking on level surface	A level surface	Week 3: 70% of maximal workload Week 4: 75% of maximal workload No. of repetitions: 2-3 20 rep. 4-5 times a day.
7-8	Deep breathing and segmental expansion Wand exercises  Chest wall stretch by pushing against a wall Arm reach and stick exercises Wall climbing exercises Ball squeezing exercises Isometric strengthening exercises for shoulder, elbow	As mentioned above	
	Active assisted strengthening exercises with elastic resistance bands/free weights from 500gm to 1kg.	TheraBand and weight cuffs	Performed with 10 sec hold and 10 repetitions, 2 times a day.
	Incremental resistance training was introduced for the shoulder and elbow with 1/2 kg to 1 kg weight cuffs.	Weight cuffs	Performed with 10 sec. hold and 10 repetitions, 2 times a day
	Static stretching of the shoulder flexors for ROM.		10 repetitions twice a day. Progress resistance and repetitions.
	Functional task-oriented exercise to reduce the complexity of everyday tasks.		10 rep. with 10 sec. hold progressing to 20 rep. with 10 sec. hold 2 times a day.
	Scar massage after scar healing to prevent contractures and adherence. Ringing, Rolling, and kneading done.		2 times a day, gradually progressing in complexity.

The patient was administered the following medications,

IV Pan 40mg

IV Penset 8mg TDS

IV Tramadol 100mg

Tab Chymoral plus TDS

Tab Vitamin C 100mg QD

Cap Becosule QD

An anaesthetic evaluation of the patient was done on 08-03-2022 in preparation for MRM. ECG, CXR, and RH typing were done. ECG showed T wave inversion in V1, V2 and AVR. CXR was normal.

Surgery was performed on 11-03-2022 under epidural anaesthesia and sedation. Postoperative physiotherapy was advised for pain and restricted range of motion of the right shoulder joint from the next day.

During the initial physiotherapy assessment, the patient complained of incisional pain and decreased ROM in the right upper extremity. Continuous dull pain was reported in the right shoulder and anterior chest. The pain was 8/10 on NPRS during shoulder movement and 5/10 at rest. Measurement of joint ROM and muscle strength could not be done due to incisional pain. On palpation, mild non-pitting lymphoedema was found in the right arm and hand.

The range of motion of the shoulder joint was restricted. A surgical incision in the right breast region caused a restriction in chest expansion. Measurement of joint range of motion was done on the fifth post operative day when the incisional pain had subsided. The patient had an ulnar deviation of bilateral wrists and Boutonniere deformity in both hands. Genu valgum was present in the lower extremities Figure 2. The PROM and MMT value for right and left upper extremities are mentioned in Table 1 & Table 2, respectively,

MMT was performed to assess the strength of muscles of the right and left upper extremities. Grip strength was assessed with a hand grip dynamometer.

Post-operatively, the patient maintained a guarded posture and avoided movement of the right upper extremity due to pain. This resulted in decreased ROM in the right shoulder and fibrosis of the anterior chest wall musculature and inhibited the patient's ability to complete activities of daily living (ADL), such as reaching overhead, sleeping, household duties, and getting dressed.

Lymphoedema of the right arm was minimal. Circumferential measurements of both arms using anatom-

ical landmarks were taken using a measuring tape on the fifth postoperative day. The circumferential measurements of limbs are mentioned in Table 3 and the chest expansion measures are shown in Table 4.

Primary concerns in management were the presence of concomitant rheumatoid arthritis which increased the possibility of surgical complications such as the increased risk of systemic and local infections, impaired wound healing, haemorrhage, delay in attaining full ROM of the shoulder joint on the affected side, restoring functional movements of the right arm and regaining functional independence.

Additional concerns were the possibility of worsening rheumatoid arthritis by flare ups caused by the surgery. The presence of rheumatoid arthritis also meant poor functional outcomes and quality of life. The patient complained of fatigue interfering with daily activities. Disease related anxiety and depression affected her willingness to do exercise.

### Interventions

Problems on the first post-operative day

1. Incisional pain (anterior chest and axilla).
2. Reduced muscle strength of upper extremity, right side > left side.
3. Decreased shoulder mobility on the right side.
4. Swelling of the right arm due to lymphoedema.
5. Chronic pain in distal and proximal joints due to rheumatoid arthritis.

From 1-5 postoperative days, routine physiotherapy was given. It included exercises to improve PROM and facilitate normal movement patterns. The following were implemented,

Passive arm movements were initiated on the first post-operative day. Mobilisations were performed within the limits of tolerance. Abduction and flexion were limited to 40°.

1. On a postoperative day 4, flexion and abduction were increased to 45°. It was planned to increase further by 10-15° per day, dependent on the patient's pain tolerance.
2. After removal of drains, soft tissue release techniques to targeted muscle groups- rotator cuff, serratus anterior, trapezius, rhomboids, biceps, and pectoralis, were started.
3. Decongestion for lymphoedema by elevation, compression using elastic bandaging of the arm and exercises.

**Table 6: DASH, BFI and HADS Scores at Weeks 1 and 8**

Outcome Measures	Week 1	Week 8	Change in score
DASH	74	20	54
BFI	7	3	4
HADS-A	12	5	7
HADS-D	11	6	5

**Table 7: Timeline of events**

Date	Summary of events	Assessment and investigations	Interventions
10-09-2020	Patient visited local hospital	Could not be ascertained	Referred to our multi-speciality hospital
29-09-2020	Patient reported to our hospital	General examination Mammogram and Biopsy	Diagnosed with invasive ductal carcinoma of right breast stage I
12-10-2020	Chemotherapy session I	None	None
06-11-2020	Chemotherapy session II	None	None
07-12-2020	Chemotherapy session III	None	None
07-03-2021	Chemotherapy session IV	None	None
30-07-2021	Chemotherapy session V	None	None
27-11-2021	Chemotherapy session VI	None	None
28-02-2022	Admitted to hospital for surgery	CBC, USG, LFT, 2D-Echo, Colour Doppler	Advised medications
08-03-2022	Anaesthetic evaluation done	ECG, CXR, RH typing done	None
11-03-2022	Surgery is done under epidural anaesthesia	All pre- and peri-operative investigations done	Peri-operative care
12-03-2022	Physiotherapy assessment done	MMT, PROM, Grip strength, functional assessment	Routine post-operative physiotherapy
16-03-2022	Multimodal exercise program started	DASH, BFI, HADS	Outcome measures noted
20-03-2022	Patient discharged from hospital	None	Advice regarding the continuation of medications and exercise protocol
11-04-2022	End of 8-week multimodal exercise program	DASH, BFI, HADS	Outcome measures noted

An eight-week, individualised, multimodal exercise program was designed and implemented from the fifth post-operative day to improve upper limb function, postoperative pain, and emotional state. As the patient had concomitant rheumatoid arthritis, components to increase joint ROM and endurance were also incorporated into the exercise program. The exercise program is shown in Table 5.

The patient was discharged after three weeks of hos-

pitalisation with instruction to continue all exercises at home. She was instructed to visit the hospital every week for monitoring of exercises. The patient was also asked to maintain a written record of her daily exercises.

#### Outcome Measures

The following outcome measures were used to assess the prognosis of the patient. Pre and post-test measurements were taken at the beginning and the



end of the exercise protocol Table 7.

### **The Disabilities of the Arm, Shoulder and Hand (DASH) questionnaire**

DASH questionnaire is a 30-item self-administered tool to measure upper-extremity disability and symptoms [9]. It is a 30-item questionnaire that measures a patient's ability to perform upper extremity functions. Patients' responses are measured on a five-point Likert scale.

### **The Brief Fatigue Inventory (BFI)**

The BFI is a 9-item, 11-point numeric rating scale to assess the severity and impact of fatigue in a 24-hour duration [10]. The BFI measures fatigue severity at current, usual, and worst levels and assesses fatigue interference with daily activities, including general activity, mood, walking ability, normal work, relations with other people, and enjoyment of life. Higher scores on the BFI correspond to greater self-reported levels of fatigue Figure 3.

### **Hospital Anxiety and Depression Scale (HADS)**

The HADS is a 14-item scale used for assessing anxiety and depression in patients admitted in hospital and outpatient settings [11]. The questionnaire contains seven questions each for anxiety and depression. A higher score indicates more severe anxiety and depression.

DASH, BFI and HADS scores were measured at weeks 1 and 8 and the values are shown in Table 6.

## **DISCUSSION**

Studies have reported a negative impact of mastectomy on the functional independence of the patient. More extensive surgery and co-morbidities may predict subsequent functional decline [12]. Following mastectomy, musculoskeletal complications such as pain, reduced joint mobility and reduced muscle strength cause functional decline. Negative illness perception is associated with poorer functional status and emotional health [13]. With most of the breast cancer cases occurring in middle-aged women who happen to be the primary caregivers of their family, it is important to restore the functional independence of these patients.

Exercise is beneficial in post-operative management and rehabilitation of mastectomy patients [14]. This study found that an eight-week individualised, multimodal exercise program induced physical and psychological improvement in the patient. Significant clinical improvement was noted in muscle strength and joint ROM, which were affected by cancer treatment, particularly chemotherapy. Strength and ROM improvement helped to reduce functional

impairment of the upper extremity. Fatigue, a common occurrence in mastectomy, may be caused by the effects of cancer, chemotherapy and the presence of co-morbid conditions.

Exercise helped to produce significant improvement in fatigue. Post-menopausal period and negative perception of body image following mastectomy may cause anxiety and depression [15]. Exercise had significant positive effects on reducing anxiety and depression.

## **CONCLUSION**

The exercise produced significant clinical improvement in the performance of functional activities, fatigue and emotional state. The strength of the current exercise program is that it is an individualised exercise program with a multimodal approach. It may be concluded that an eight-week multimodal exercise program is clinically effective in improving functional independence, fatigue, anxiety and depression in mastectomy patients with co-morbidity. It may be recommended for mastectomy patients in similar settings.

## **Abbreviations**

- MRM Modified Radical Mastectomy
- ALND Anterior Lymph Node Dissection
- ROM Range of Motion
- DASH Disability of Arm, Shoulder and Hand
- BFI Brief Fatigue Inventory
- HADS Hospital Anxiety and Depression Scale
- ALND Anterior Lymph Node Dissection
- RAT Rapid Antigen Test
- LCB Last Child Birth
- LMB Last Menstrual Bleeding
- NPRS Numeric Pain Rating Scale
- PROM Passive Range of Motion
- MMT Manual Muscle Testing

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## **Conflict of Interest**

The authors declare that they have no conflict of interest.

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## Informed Consent

Informed consent was obtained from the patient.

## Ethical Clearance

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